NPA Seminar

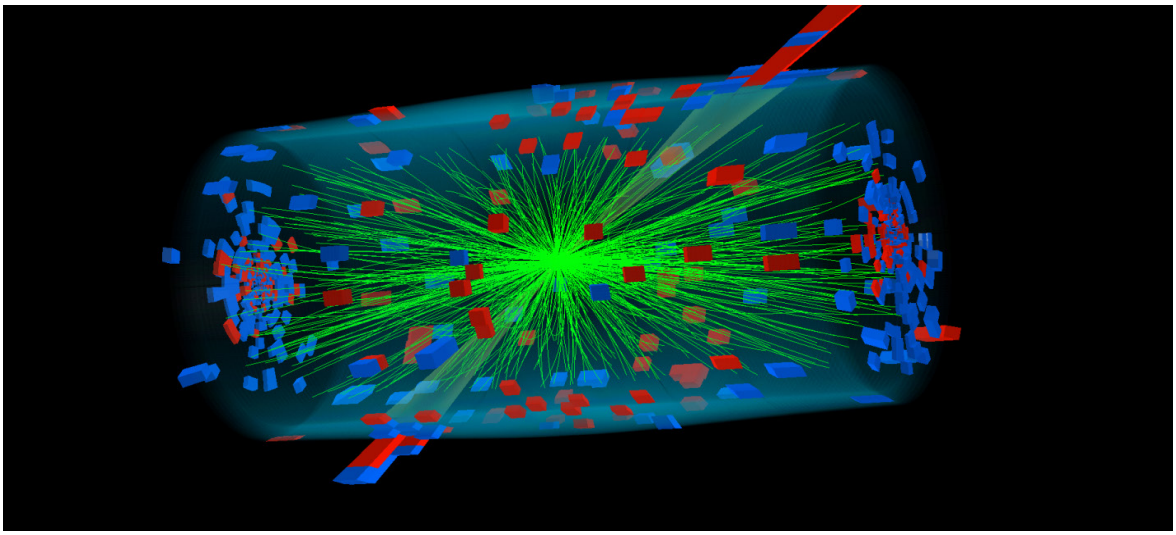
Wright Laboratory

Austin Baty

Rice University

January 26, 2023 at 1:00 pm in WL-216

Jets and trillion-degree matter: studying QCD at multiple scales



The theory of the strong nuclear force - Quantum Chromodynamics (QCD) - describes the interactions between fundamental particles known as quarks and gluons. In this talk, I will explain how the strong nature of the QCD interaction results in phenomena having unique and intriguing properties. One such example is the creation of a hot, dense form of matter that behaves like a 'perfect liquid,' known as the quark-gluon plasma (QGP), in collisions of high-energy nuclei. Another QCD phenomenon is the fragmentation of high-momentum quarks and gluons into streams of particles known as jets. Jets are multi-scale objects with a complex internal structure that encodes information about the QCD interaction. Furthermore, when passing through quark-gluon plasma, jets are known to lose energy and have their structure modified in a process known as 'jet quenching.' I will discuss how jets and their internal structure can be used to experimentally probe the QGP at short length-scales to learn more about its microscopic internal dynamics. In particular, I will review recent results and discuss opportunities for future data coming from the Large Hadron Collider. Additionally, I will describe how jets can be used to search for QGP-like effects in smaller collision systems such as proton-proton and proton-ion collisions. Finally, I will discuss upcoming opportunities to examine jets and their substructure at the next major facility for QCD studies: the Electron-Ion Collider (EIC).

Sponsored by the Flint Fund, Yale Wright Laboratory, Yale University, and the Yale Physics Department.